International Armoured Vehicles

CONFERENCE & EXHIBITION

London, 8-9 February 2011

The Swedish Armoured Fighting Vehicle programmes

"Getting the most from protected platforms as weapon systems"

Rickard O. Lindström

Strategic Specialist Combat Vehicles

Land Systems Procurement Command

Swedish Defence Materiel Administration (FMV)

FMV

Who am I…

- In 1971 – my first AFV meeting in El Alamein (Egypt)…
- Military service from 1978 as an Officer in the Reserve
- At FMV since 1986 – part of all major AFV programmes
- My first book on Swedish Armour in 2008

Previous presentations at LMAV…

…very much influenced by the SEP programme…

Agenda

- The Transformation of the Swedish Armed Forces and the new strategy for materiel supply
- Current objectives for the Swedish Armoured Fighting Vehicle systems
- Ongoing procurement programmes utilising the lessons learned from past programmes
- The aftermath of SEP – continued R&D

A changing world

…and the transformation of the Swedish Armed Forces

FMV

The Policy of Swedish Security

Swedish " policy of neutrality"

1989

Swedish "policy of <u>military</u> non-alignment" - with an <u>option</u> to be neutral in case of war

2009

Swedish " policy of solidarity "

"Cold War"

"Post-Warzaw Pact"

Declaration of Solidarity

as put forward in the Defence Commission's reports

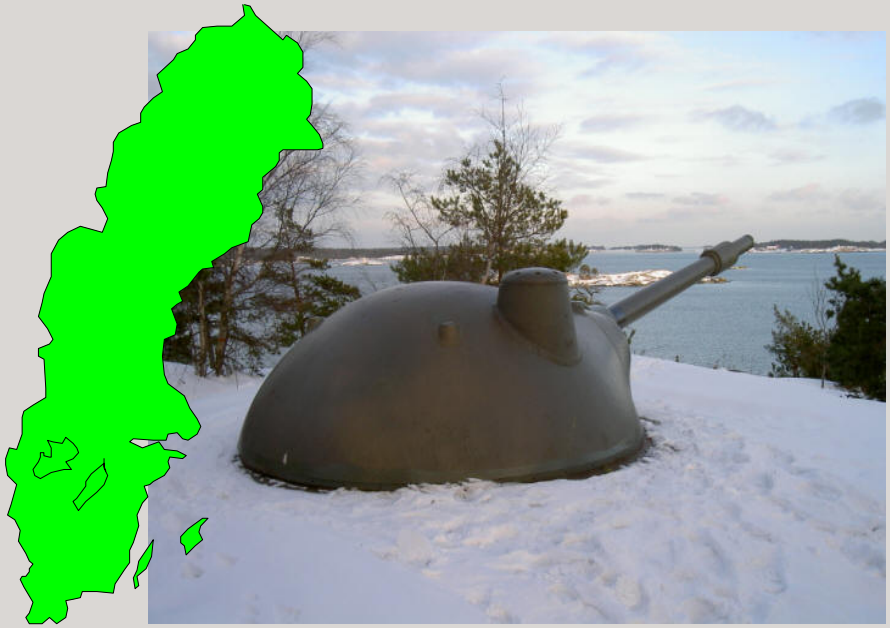
"Sweden will not take a passive stance if another EU Member State or other Nordic country suffers a disaster or an attack. We expect these countries to act in the same way if Sweden is affected.

This means that Sweden can contribute with military support in crisis and conflict situations. We must be able and willing to help one another in the event of accidents, crisis or conflicts, by contributing with relevant capabilities.

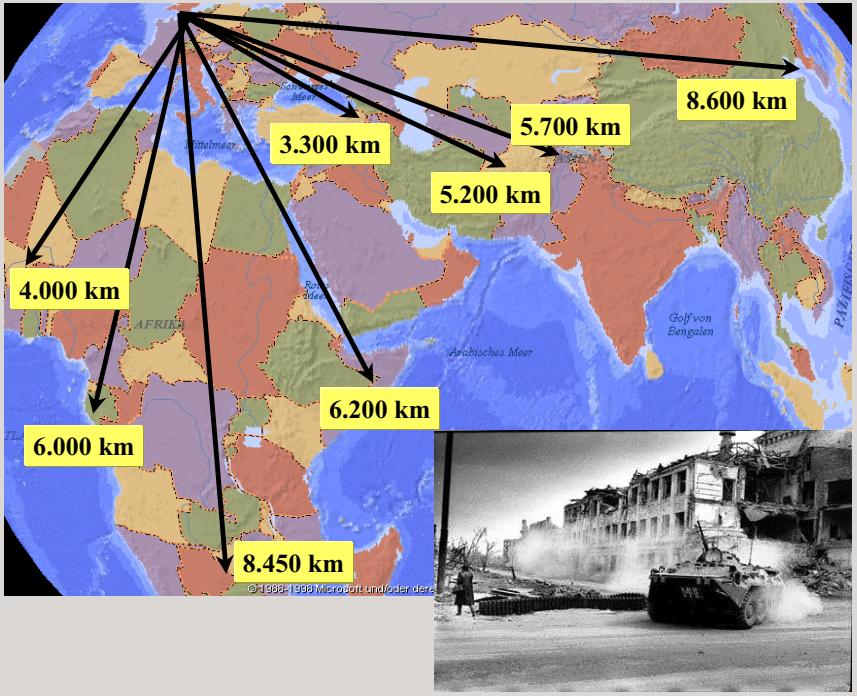
In this context, Sweden must be able both to receive and to give military support."

Possible Environments for Insertion

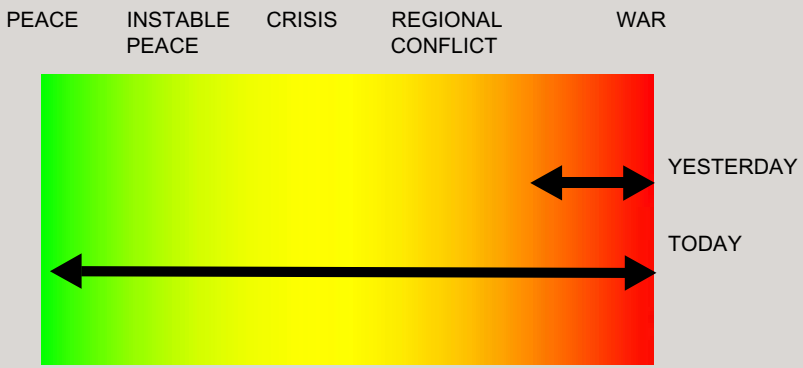
YESTERDAY

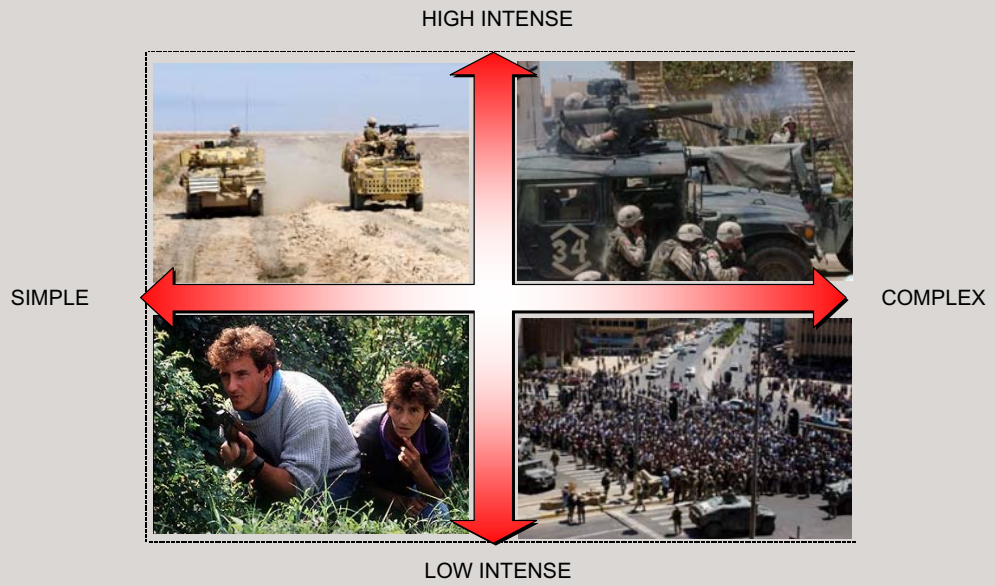


TODAY

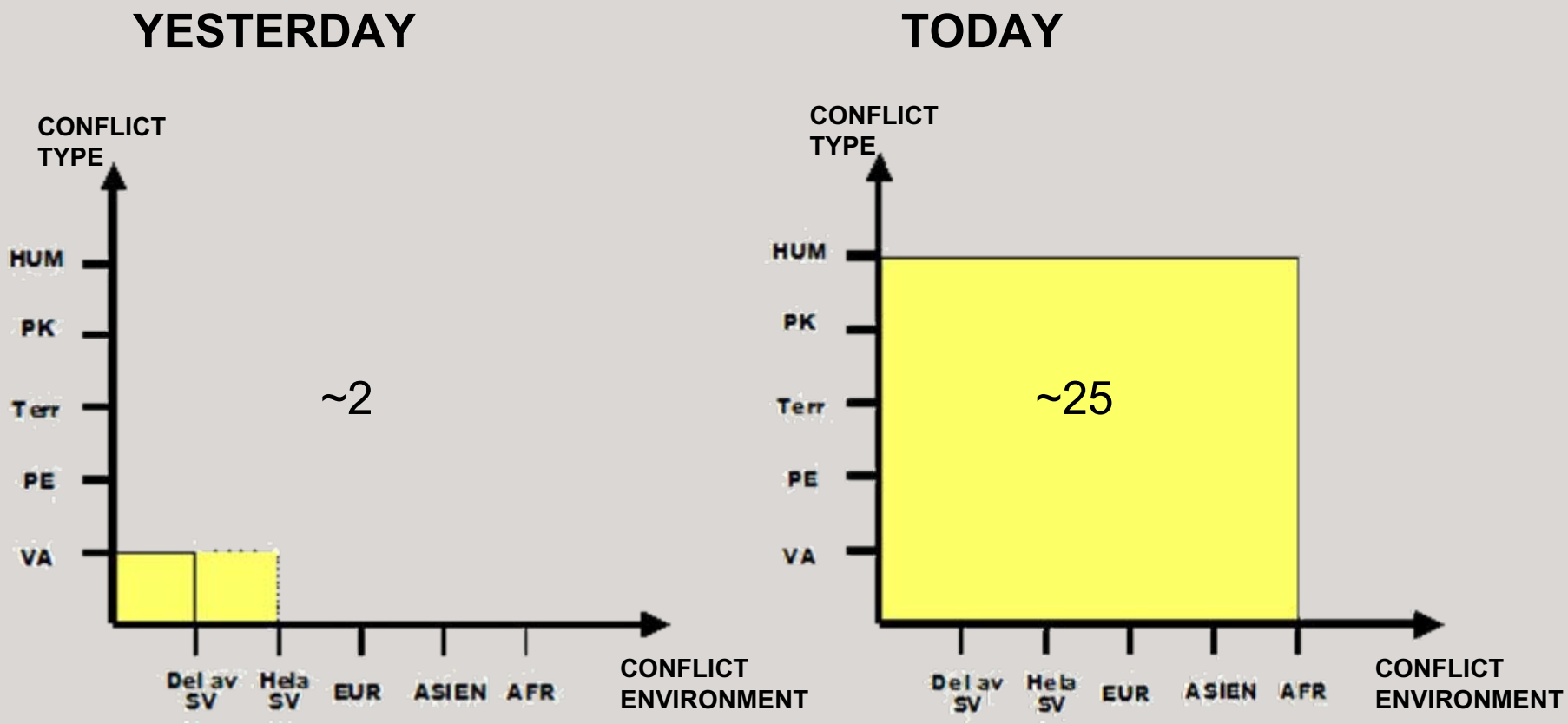


The Conflict Development



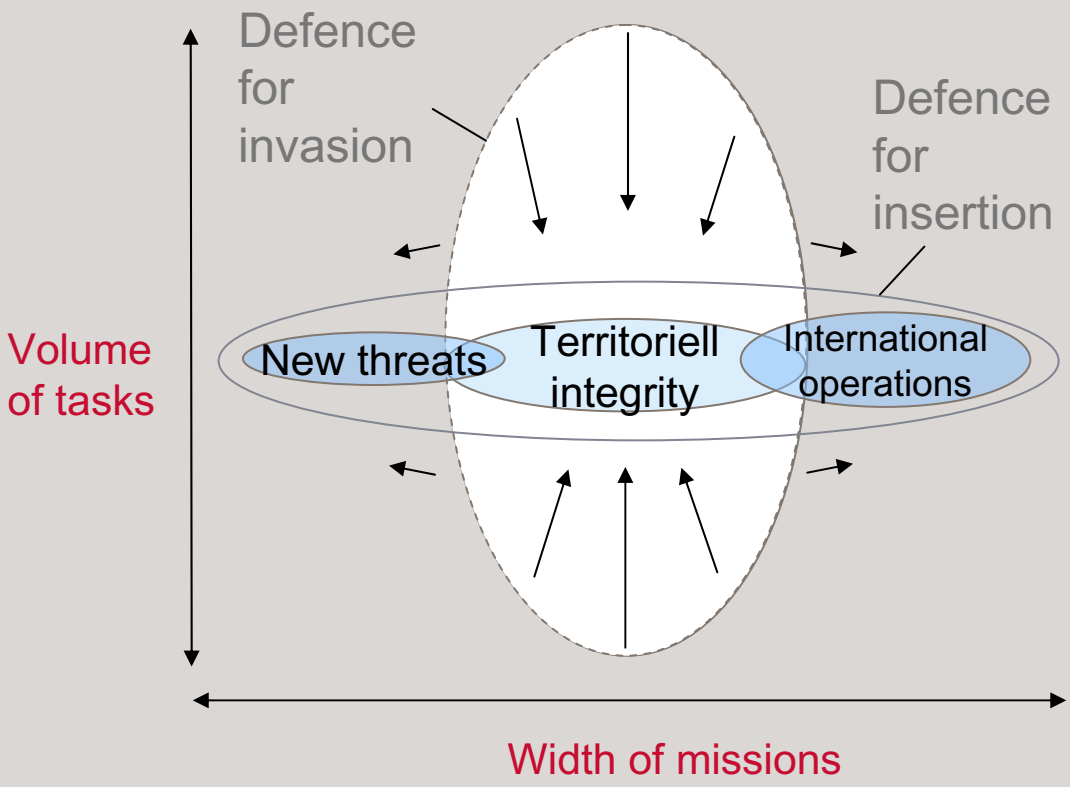


Operational frame conditions



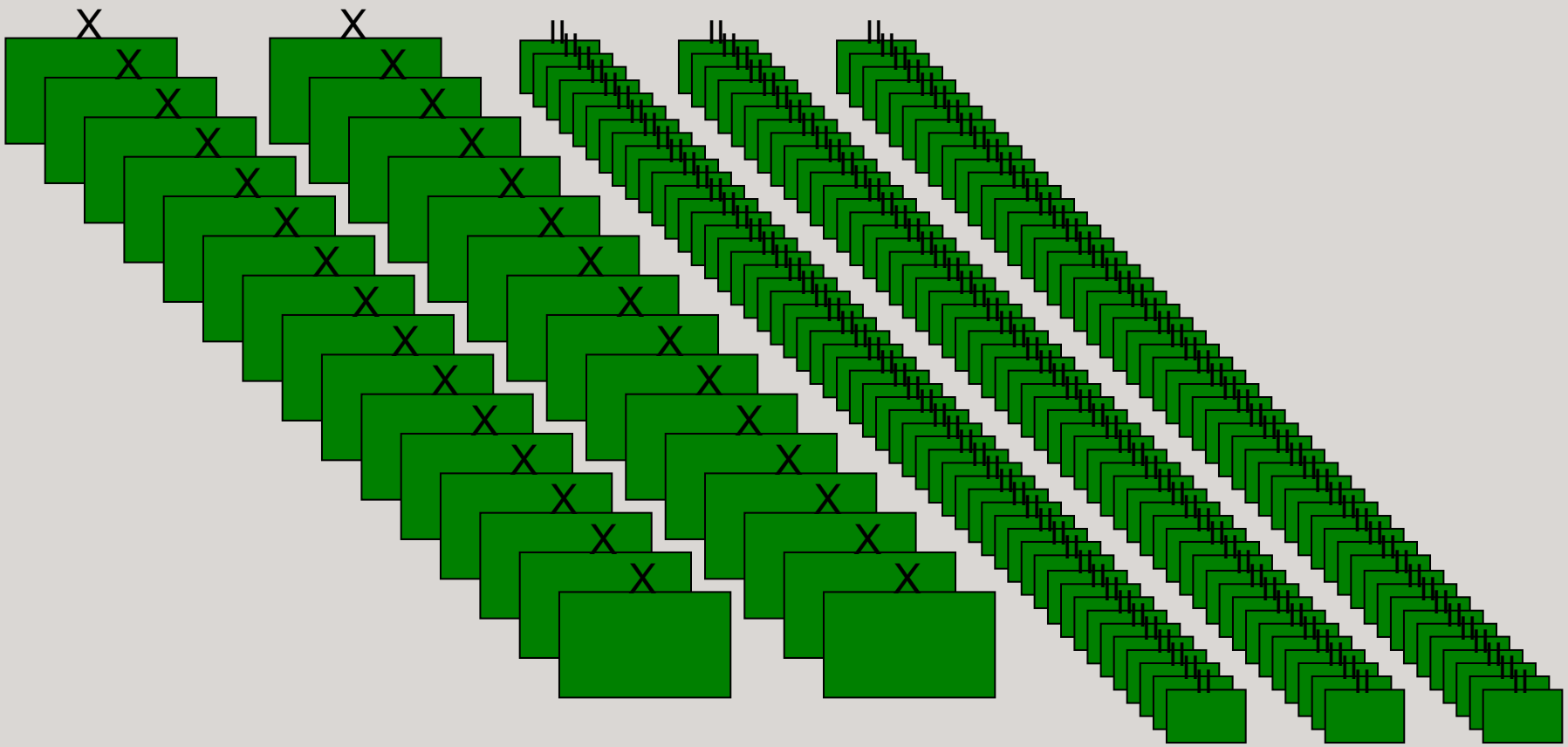
Swedish Armed Forces changed tasks

- No invasion threat
- Multifacitaded threat
- International engagement
- Immediate useable operational forces
- Civilan and military co-operation nationally and internationally



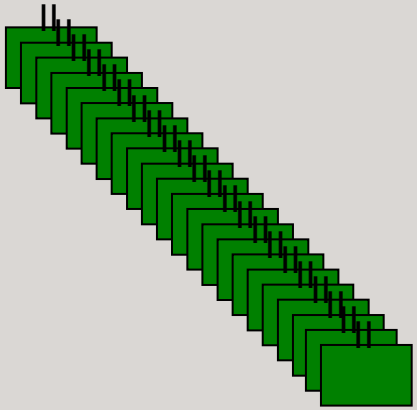
1977

30 brigades, 150 freestanding battalions
~430.000 men + Home Guard 100.000 men



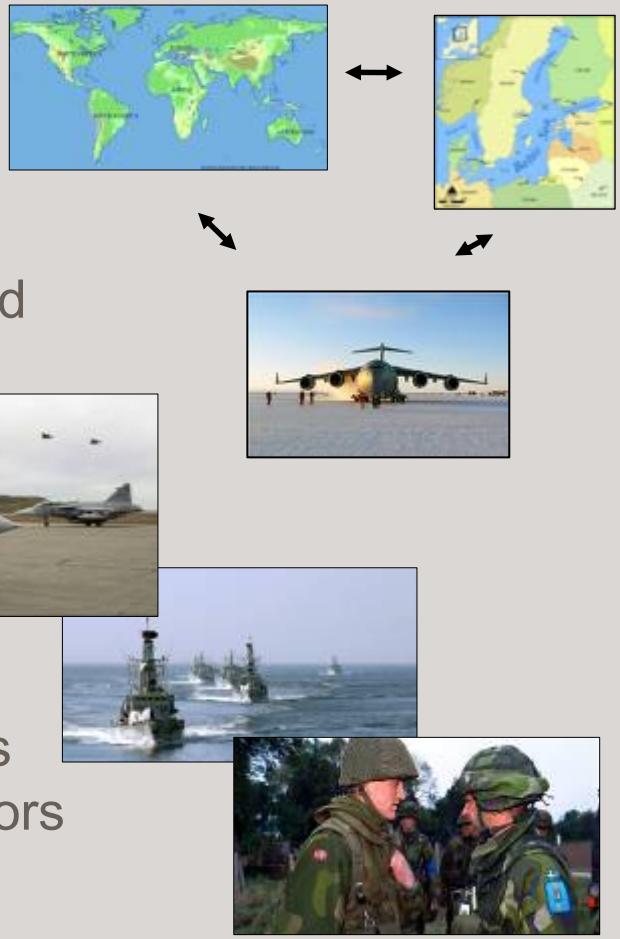
2014

0 (2) brigades, 22 freestanding battalions
~15.000 men + Home Guard 30.000 men



Transformation objectives

- Availability
  - Today for national as well as international tasks
  - Operational and strategic mobility
- Usability
  - Swedish territory as well as abroad
  - Single set of Forces
- Flexibility
  - All Conflict Levels
  - Organization
  - Modularity
- Cooperation
  - Other Countries and organizations
  - Other Swedish Governmental Actors
  - Civil-Military

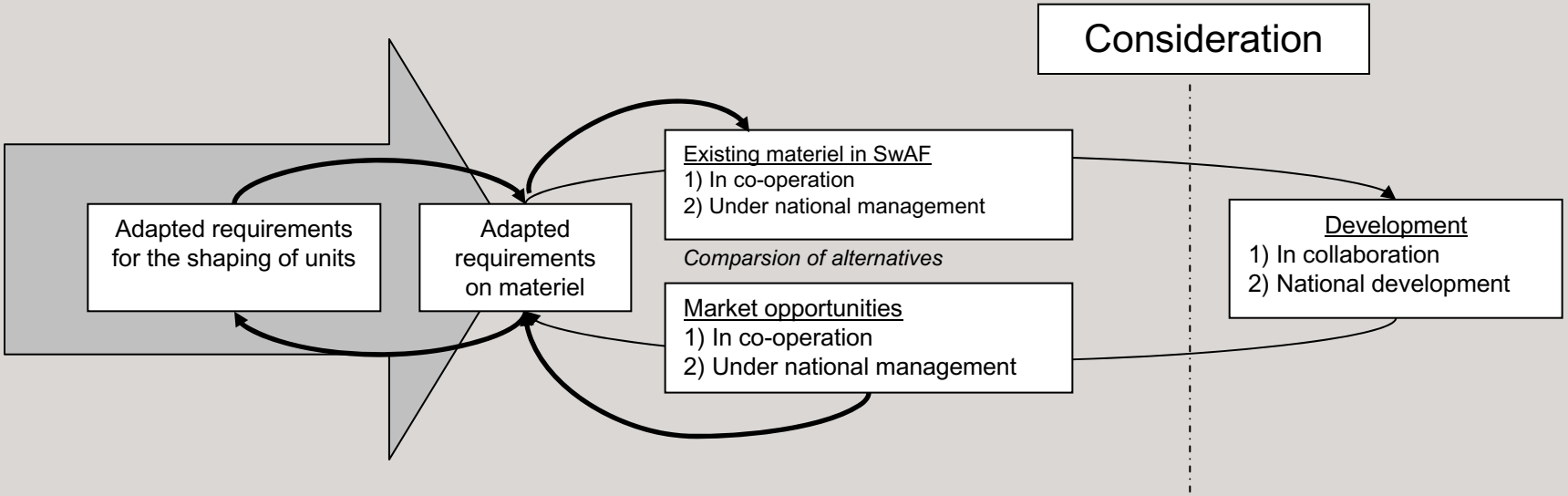


Expeditionary Capability

- Up to 2000 men deployed abroad
- Framework nation for EUBG
- Comprehensive approach
- Strategic Airlift Capability (SAC)

Strategy for Defence Materiel Supply

The model for defence materiel procurement



- Equipment in use, not in storage
- Effect today, not tomorrow
- Good enough here and now, not ”best in class” in the future
- Interoperability more important than Swedish high-tech
- Short series, rather than long-term development efforts

Current objectives of Swedish Armoured Vehicle programmes

- Update inventory
- Ongoing activites

CV90 vehicle family

- CV90 – a family of combat vehicles
- 509 + 40 vehicles delivered 1994-2002
  - Different generations (A, B, C)
- The different variants of CV90:

CV 9040	354
Forward Observation Vehicle	42
Forward Command Vehicle	56
Anti Aircraft Vehicle	30
Armoured Recovery Vehicle	26
Electric Warfare Vehicle	1
Chassies for supporting vehicles	40

- International co-operation within the ”CV90 Users Club”

- Upgrading planned 2013-2018
  - Renovation
  - Limited modifications
- New fire extinguishing system
  - Replacement of halon
- Ongoing studies:
  - Investigation of vibrations
  - Rubber band tracks
  - New variants on rebuilt chassies
    - Ambulance
    - Mortar carrier
  - New combat ammo





Mission experiences with CV90

- Liberia:
  - UNMIL SWECON 2004 - 2006
  - Part of the Irish Battallion
  - 11 CV9040C, 1 FOV90C, 1 ARV 90C
  - Systems worked very well (12,000 km)
  - Hard wear and tear of tracks
  - Dehydration a must

- Afghanistan:
  - ISAF - International Security Assistance Force
  - In duty from June 2009
  - 8 CV90C, 1 ARV 90C in Afghanistan
  - 13 CV9040C and 2 ARV 90C (strategic reserve)
  - MLU planned at 12,000 km
  - Systems work very well, dehydration a must!

Leopard 2 vehicle family

- Leopard 2 vehicle family:
  - MBT 122 (new Leo 2 A5S) 120 procured 1997-2002
  - MBT 121 (used Leo 2 A4) 160 procured 1995-1998
  - ARV 120 (armoured recovery) 14 procured 1995-1998
  - AEV 120 (armoured engineer) 6 delivered from 2011
- International co-operation within the Leopard MBT ”LEOBEN Users Club”
- Upgrading planned 2013-2018
  - Renovation & modifications (limited)
- MBT 121 now phased out – to be sold

- Ongoing procurements:
  - Mineprotection for another
    - 4 MBT122B
    - 2 ARV120B
  - Replacement of halon
- Ongoing discussion:
  - The need for an Armoured Bridge Layer based upon Leopard 2 chassies




MBT 121A

Strv 121A (Leopard 2 A4)

Strv 121A (MBT 121A)

- 160 MBT 121A in long term storage
  - Now phased out
- 1 MBT 121B
  - prototype/upgraded partly towards MBT 122A status (electrical laying, suction ventilation system)
- 6 MBT 121A chassies reused for the conversion to AEV 120 (Kodiak)
- Some of the MBT 121A expected be reused for ABL 120 (bridge layer)
- The remaining Leopard 2 A4 are now being sold

MBT 122A & MBT 122B
(Leopard 2 A5+)

Strv 122A (MBT 122A)

- 110 MBT 122A, some in use for training but most in storage
- 4 MBT 122A to be equipped with mine protection → MBT 122B

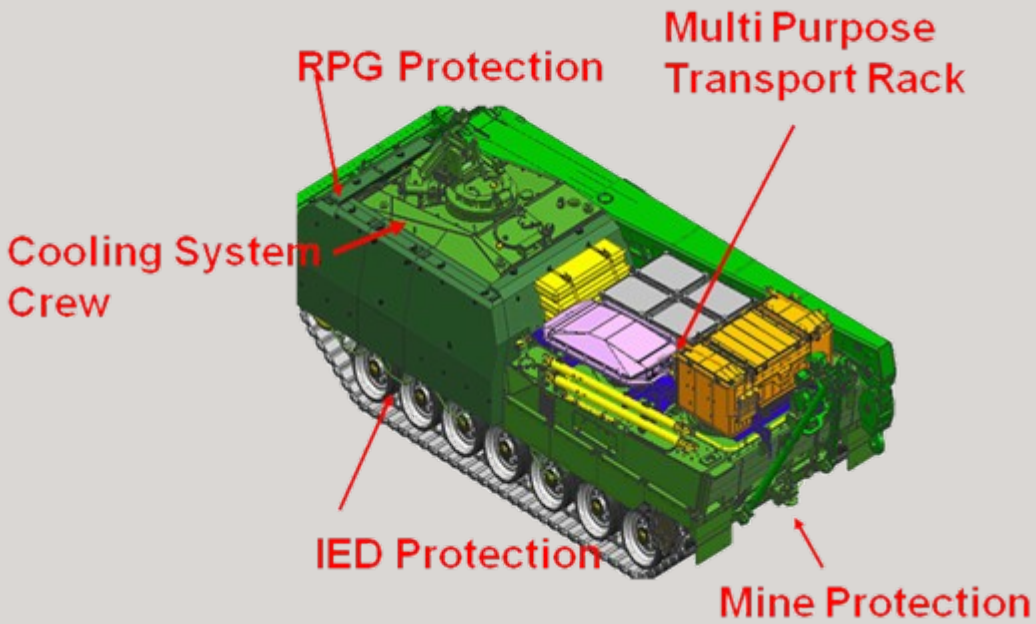
Strv 122B (MBT 122B)

- 10 MBT 122B with mine protection, in storage waiting for deployment in international mission
- 4 more MBT 122B → complete company

ARV 120A

Bgbv 120A (BPz 3, ARV 120A)

- 14 ARV 120A are in use
- 2 of those are now being equipped with mine-, IED- and RPG protection
  - → ARV 120B



AEV 120A

Ingbv 120A (AEV 3 “Kodiak”)

- 6 AEV 120A - deliveries from 2011
  - All delivered before the end of 2013
- Development in co-operation with The Netherlands since 2008
  - 20% savings in the procurement costs
  - Contract with RLS
- Built on Leopard 2 A4 chassis
  - 6 phased out MBT 121A are used
- Engineering subsystems
  - Hinged-arm excavator
  - Quick-release coupling for deploying additional combat engineering tools
- Switzerland is a previous user
  - “KODIAK User Club”

Armoured Tracked Vehicles

- ”Armoured Tracked Vehicles” is the designation for many different armoured combat vehicles in different configurations and versions
- They are used in many different roles (for example personell transport, command & control, repair, bridge laying, ambulance, others)
- A process for phasing out most of these vehicles has started
  - Pbv 302 (vehicle family) 292 still in service (out of 650) – 20 mm cannon being modified
  - Pbv 401/4020 (MT-LB) 203 still in service (out of 520, the rest being sold), to be phased out
  - Pbv 501 (BMP-1) 350 now phased out (has recently been sold)
  - Brobv 971 (BLG 60) 12 still in service (out of 32)
  - Bv 308/309 (”Bv 206S”) 93 still in service (Bv 308 for training – Bv 309 for international missions)
- A new light tracked vehicle now to be procured

Bv 308 & Bv 309

- Articulated & protected all terrain vehicles
  - Procured to replace Bv 206
- 19 Bv 308 today used for training
  - A substitute to Bv 309
- 91 Bv 309 in two versions:
  - Bv 309A (basic configuration)
  - Bv 309B with a new suspension and with amphibious capability
- Bv 309 in 6 different variants:
  - Armoured Personnel Carrier
  - Command & Control
  - Logistic
  - Ambulance
- Used in missions since 2003
  - Liberia

Armoured Wheeled Vehicles

- The armoured wheeled vehicles are mainly used as personell carriers but also for other role functions (for example ambulance, radio link, command)
- The vehicles are intended to be used mainly on roads
- The armoured wheeled vehicles:
  - Pasi XA-180 6x6 — 35 (Patgb 180 – mainly used in international missions)
  - Pasi XA-202/203 6x6 — 170 (Patgb 202/203)
    - Ongoing studies to adopt desert proven filter and to replace halon
    - Ongoing conversion of 2 (or 6) XA-203 into IEDD vehicles
  - Piranha IIIC ASV/ACV 10x10 — 13 (Patgb 97 – no longer part of operational forces)
  - RG32M 4x4 — 260 (Ptgb 6 – now being upgraded with Protector OWS)
- A new armoured wheeled vehicle now being procured

Patgb 180 (XA-180)

- The 6x6 vehicle from was procured from Patria during the 80s' and the 90s'
  - XA-180
  - XA-185
- Today 34 Patgb 180 remain in service in different variants:
  - Armoured Personnel Carrier (22)
  - Ambulance (10)
  - Improvised Explosive Device Disposal EDD (2)
- Patgb 180 have been used in different international missions since 1988
  - Lebanon
  - Bosnia
  - Kosovo
- Plans to be phased out 2015

Patgb 202 (XA-202)

- 20 XA-202 was procured 2001-2004 from Patria as a ”single-source” procurement
  - Finland bought CV90
- Delivered in 4 different variants
  - Command (5)
  - Jam (1)
  - Position finder (3)
  - Radio Link (10)
- Used together with XA-203 in different international missions
  - Afghanistan
- ”XA-User Group” with other nations
  - Finland, Norway, Denmark and the Netherlands
  - Also including XA-180 series

Patgb 203 (XA-203)

- 149 XA-203 was procured 2001-2004 from Patria as a ”single-source” procurement
  - Finland bought CV90
- Delivered in 8 different variants
  - Armoured Personnel Carrier (68)
  - Command & Control (10)
  - Mortar (6)
  - Anti Tank (16)
  - Repair (15)
  - CBRN (2)
  - IEDD/EOD (6) – now being upgraded
  - Ambulance (26) – now being upgraded
- Armed with 20 mm automatic cannon
  - Re-used from Pbv 302 (who got it from J29)

IEDD = Improvised Explosive Device Disposal
EOD = Explosive Ordenace Disposal
CBRN = Chemical-Biological-Radioactive-Nuclear

Ongoing activities with Patgb 202/203

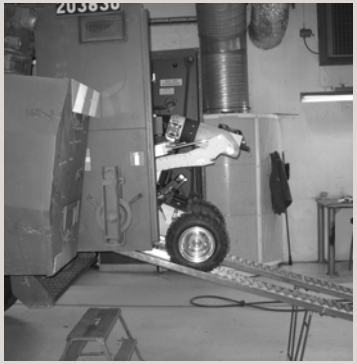
Integration of ROWS – Remote Overhead Weapon Station – Protector med HMG cal .50 (20 mm AKAN to be phased out)

Integration of a new ultra fast Fire extinguishing system (AFES)

Integration of a new 66 mm smoke grenade system

Upgrading of the Ambulance and the IEDD/EOD variants

Survivability studie for better protection against mines and RPG



Planning for Mid-Life Upgrade (MLU) 2013-2016

Patgb 97 & Radarpatgb 740

- 13 Piranha IIIC 10x10 were procured from 1996 for the Marines amphibious units
  - Costal Defence
- Two variants
  - ACV – Armoured Command Vehicle (7)
  - ASV – Armoured Sensor Vehicle (6)
- The vehicles are no longer part of the operational units and ar used sporadic
- Some of the vehicles are on lease to other nations
  - Used to locate artillery

Patgb 6 4x4 D SPS ”Galten”

- The RG-32M was procured from OMC (BAE) in 2005 after extensive trials
- 200 vehicles have been delivered in three different variants (another 60 in production)
  - Patrol vehicle
  - Satellite Communication
  - Electronic Warfare
- Vehicles are now being modified for ROWSS Protector HMG with add-on armour for continued duty in Afghanistan

FMV latest investigation in Afghanistan

- A number of Swedish vehicles and personnel were attacked during and after the election in Afghanistan
- Main threat was IED (HME)
- Vehicle systems attacked
  - CV9040 C
  - RG32 M
  - XA 203
- One person killed and several injured

Lessons learned – actions taken

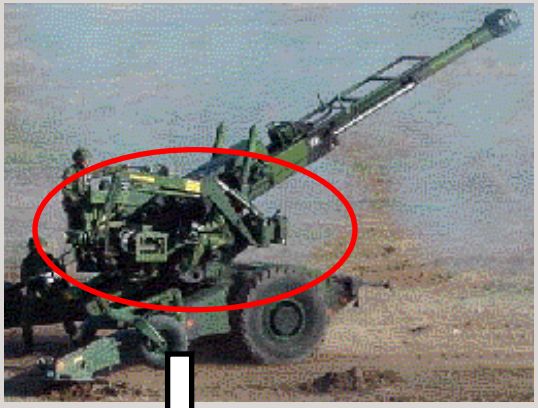
- Direct feedback from theatre is very important to be able to support the troops with appropriate materiel
- *Technical and medical damage analysis* is very important in order to identify improvements of materiel and tactics
- Interviews with the involved personnel is important in order to be able to perform a correct *Technical and medical damage analysis*
- A working group between SwAF HQ and FMV for information sharing and immediately actions has been initiated
- A number of urgent operational requirements has been identified as well as long term measures

ARCHER – 15,5 cm Artillery system

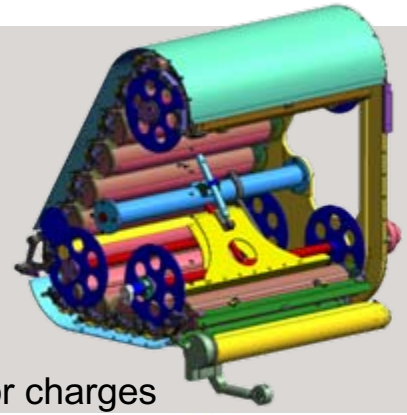
- ARCHER – the next generation self-propelled artillery system - studied since 1995 to replace the older Haubits 77B
- Development since autumn 2008 in a co-operation with Norway
  - Agreement on Industrial Balance signed December 2009
  - Contract for series production signed early 2010
- The Swedish Armed Forces intends to set up ARCHER battalions with all the 24 vehicles
  - First delivery in 2011, all vehicles delivered in 2014
- In parallell new 155 mm ammuniton being procured - EXCALIBUR

REMO haubits 77B ARCHER

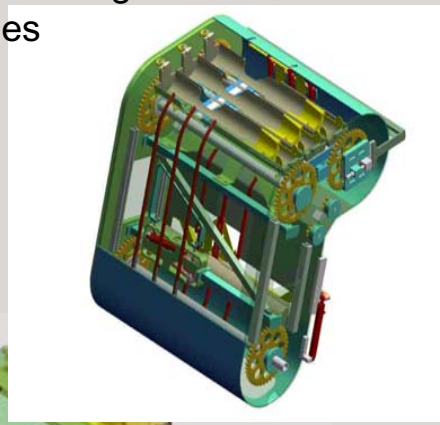
Volvo A30E Dumper



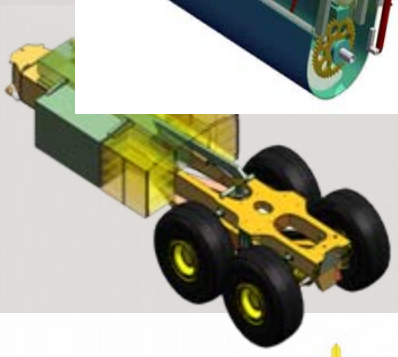
Weapon from
haub 77B



Magasine for charges
and grenades



Splinter and mineprotected cabin



Mortar systems

CV90 with the 120 mm AMOS system

- Continued use of towed mortar systems
  - 120 mm
  - 81 mm
- Study for a new battalions artillery after 2015

Transformation into fewer AFV systems

2008 **2014**

Ongoing AFV procurement

After ”the SEP decison” still a need for both wheeled and tracked vehicles:

- Armoured Wheeled Vehicle
- New Light Tracked Vehicle

AWV – Armoured Wheeled Vehicle

- Background:
  - Decision 4th of February 208 not to contiunue the development of SEP
- Still a need for armoured wheeled vehicles for 2 mechanized battalions
  - IOC 2014 with 113 vehicles (first battalion)

79 APC	**7 Repair**
16 C2	**11 Ambulance**

- Timetable for the 1st of try:
  - RFI published 13th of June 2008
  - RFQ published 30th of Octoberber 2008
  - Evaluation from 30th of November 2008
  - Contract award to Patria 25th of June 2009
  - 2nd of July 2009 BAE complaint
  - 29th of October 2009 Court rules FMV
- Timetable for the 2nd try:
  - RFQ 30th of December 2009
  - Evaluation from 9th of March 2010

THE COMPETITORS

Piranha III – GDLS

Boxer - ARTEC

AMV – Patria Vehicles

VBCI - Nexter

SEP – BAE Hägglunds

Alligator – BAE Hägglunds

AWV – Armoured Wheeled Vehicle

- Three contractors were deemed not to fulfil all mandatory requirements
  - ARTEC with Boxer 8x8
  - BAE with Alligator 8x8 (although a was clarfication needed)
  - GDELS (Mowag) with Piranha III 8x8
- Two contractors were deemed to fulfil all mandatory requirements:
  - NEXTER with VBCI 8x8
  - Patria with AMV 8x8
- The following evaluation showed that the AMV was the best alternative
  - Especially the costs were in favour for Patria – a contract was signed 13th of August 2010
  - Contract for the whole AWV system – 113 vehicles (option for another 113 vehicles)
- On the 23rd of August 2010 General Dynamics European Land Systems – Mowag GmbH send in their formal submission of its objections
  - GDELS stated that they did fulfil the mandatory "shall" requirements and they provided an explanation why they changed the offered performance (it differed from what FMV asked for)
  - Can a difference between 20,1 and 15 hp/t in any way can influence a vehicle's performance?
- On 26th of November the Court ruled that FMV has conducted the acquisition fairly and dismissed the complaint
  - The procurement of AMVs from Patria could begin – almost 3 years after the "SEP decision"
- First deliveries in 2012 and full operating capability in 2014

AMV XA-360

Experiences with UDES XX20

Tested 1980-1983

- Extreme mobility in combination with very high firepower was the main objectives
- The front car had a 3-men crew with a remotely controlled turret located above the steer unit (concentric to the steer axis)
- A high horsepower to weight ratio together with extreme long ground contact length and high capacity suspension gave extremely high terrain speed
- At a total weight above 20 tonnes the extreme mobility was lost in soft soil and deep snow due to the fact the rear carrier moved in existing deep tracks

Original idea with SEP…

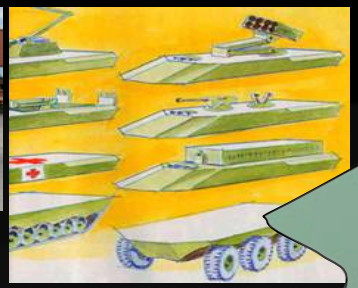
2008

2014

Development history and plan







E-drive Gen2 tracked demo

Diesel electric tracked demo

New tracked E-drive system

Diesel electric wheeled demo

Hybrid electric tracked demo

Technology Evaluation

E-drive Gen3 specification

Specification & Supplier evaluation

Supplier selection

Development & System tests

1993 2000 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014

Prototypes

Gen 1

Gen 2

Gen3

Studies & evaluation

FMV New Direction

Project Stoped

Pre series

Functional growth

Modularity

Role-module Integration

Advanced Traction Control

Safety

User Support System

Tracked Roll out

Wheeled Roll out

High Mobility Performance

Integrated development potential

Advanced protection

Maintenance Support system

Troup Training and education

Series production

System in Battlefield use

Production starts

Preparation for full production

Test & validation

Vehicle tests





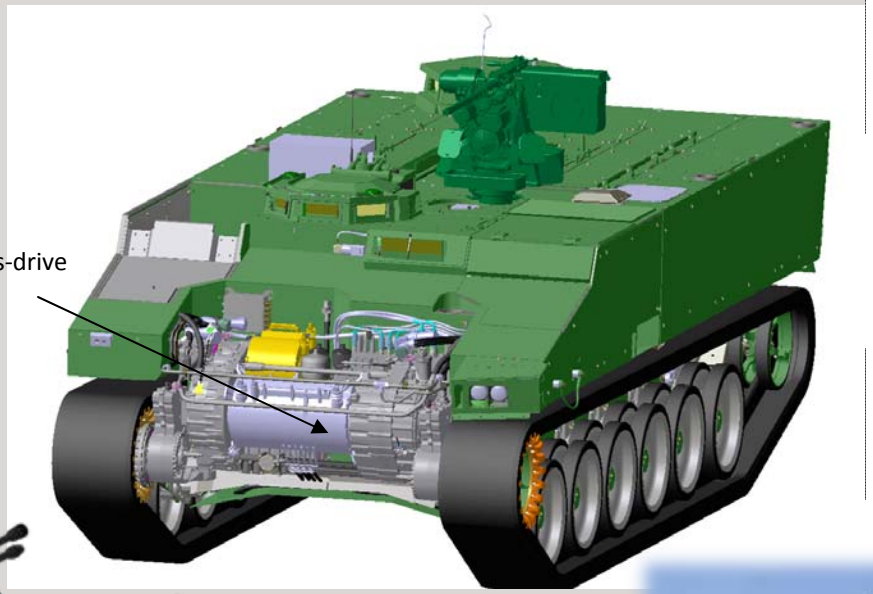

Outcome of the SEP project

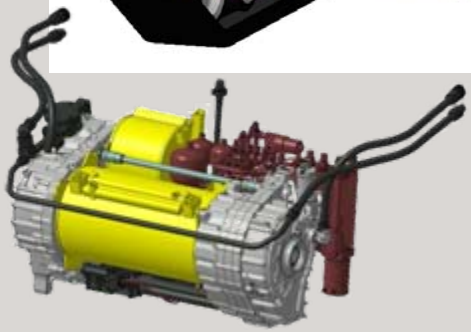
Eight technology areas with high potential for further development were identified within the SEP project:

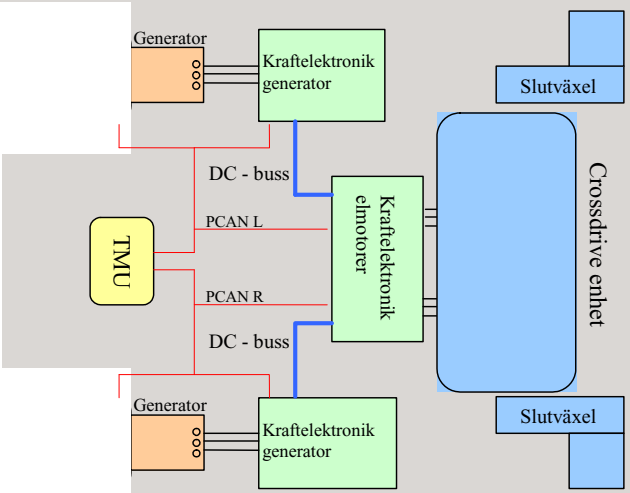
1. Electric transmission
2. Two combustion engine solution
3. Rubber Track
4. Decoupled running gear
5. Electro optic periscopes
6. Vehicle Electronics
7. Ballistic protection and survivability
8. Modularity

Continued tests with SEP preseries production vehicles in 2010…

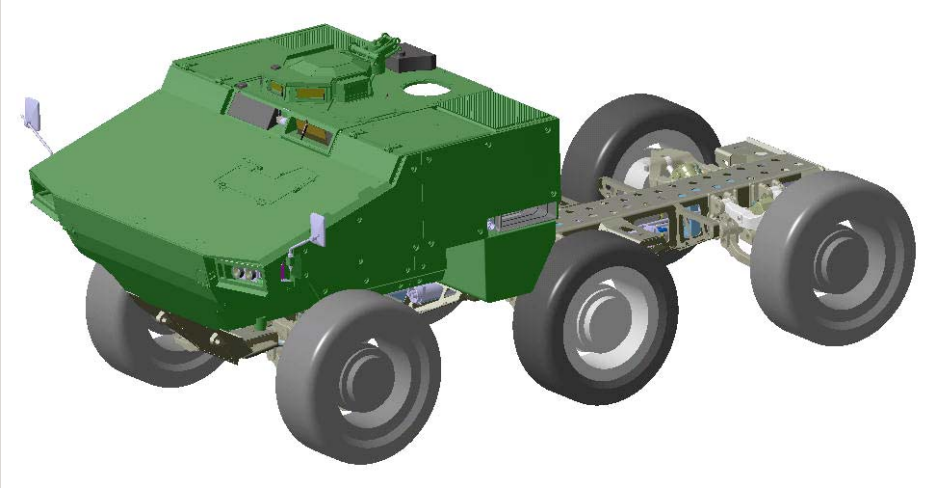
SEP Tracked - Electric transmission

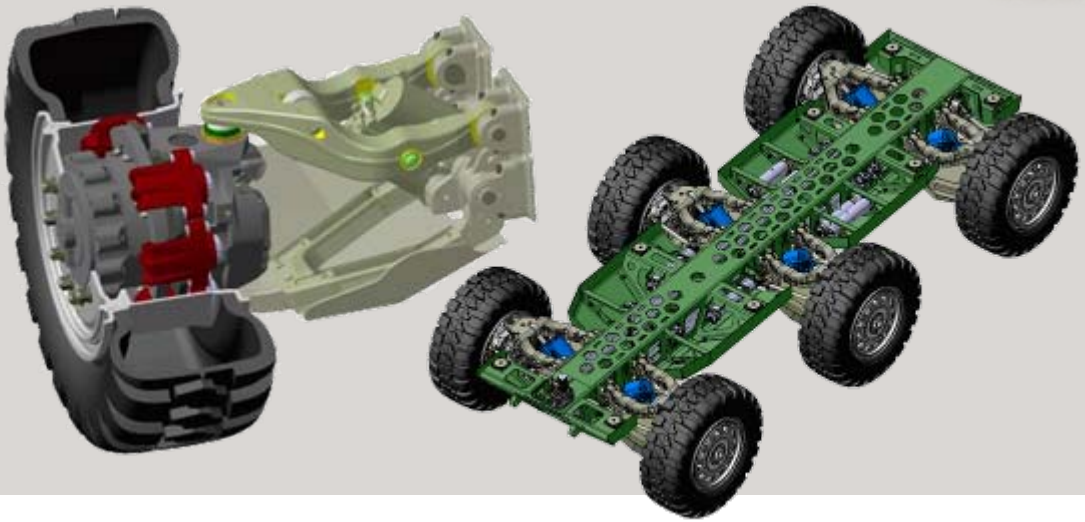




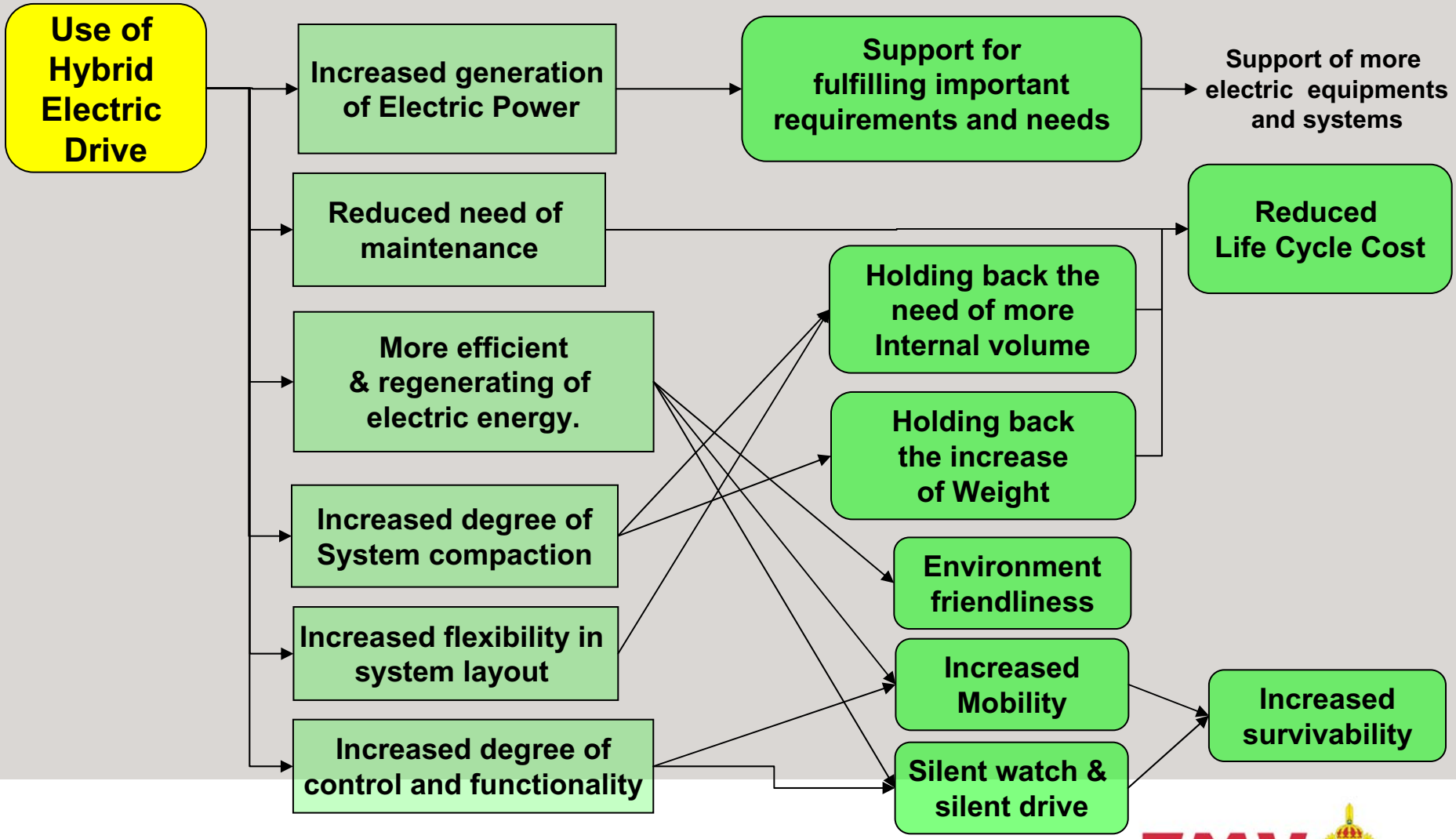


SEP Wheeled – Electric motors in hubs

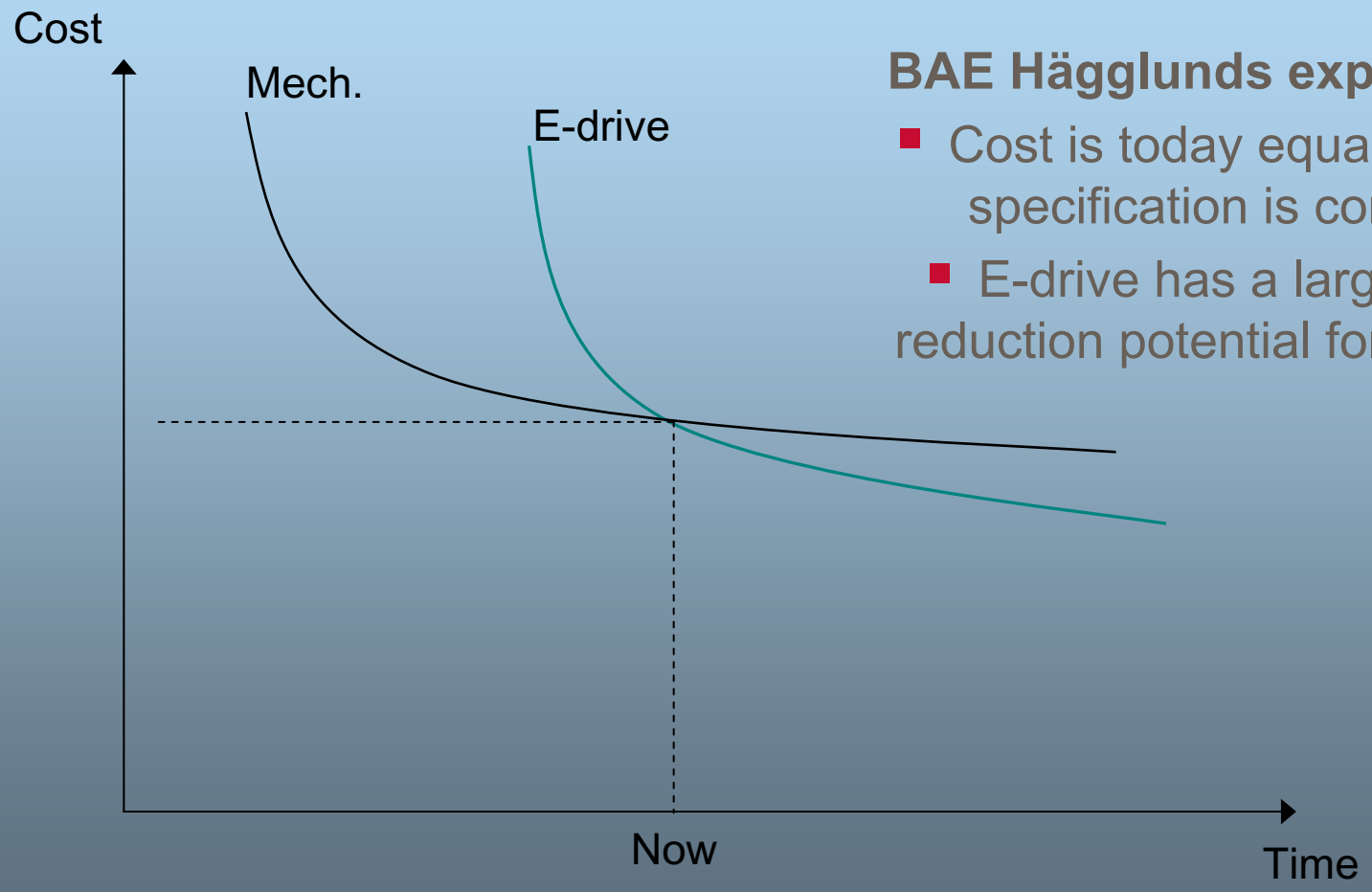




Possibilities in using HED



Cost E-drive vs. Mechanical drive



BAE Hägglunds experience:

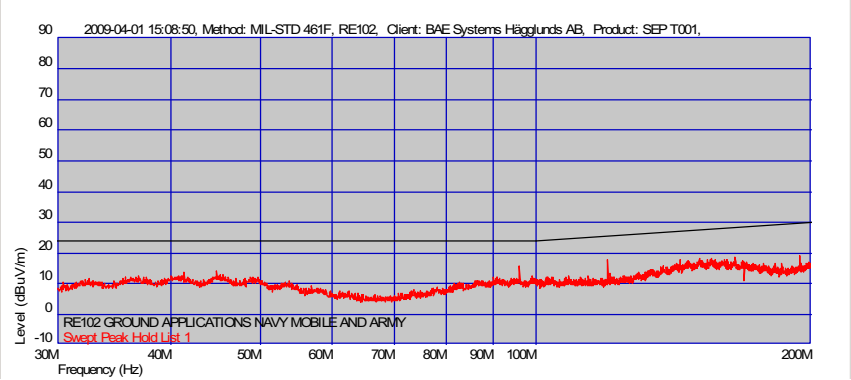
- Cost is today equal if same specification is compared
- E-drive has a larger cost reduction potential for the future

E-Drive – Outstanding performance

- From stand still to 112 km/h in less than 1000m
- Low fuel consumption 4.25 l/mil @ 85 km/h (23 tonne SEP 6x6)
- Individual torque control → gives terrain driving a new meaning
- Incredible low noise and vibration in a tracked vehicle at 85 km/h
  - A dialouge possible without helmet and ear wear

EMC-test T001 (SEP Tracked)

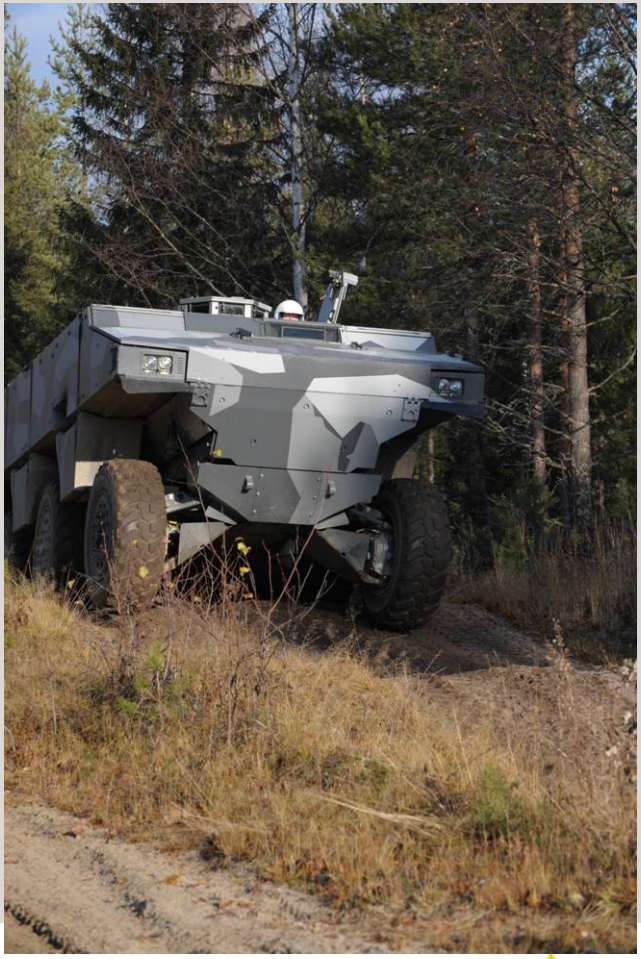
- Drive-train system fulfilled emission level in MIL-STD 461F, RE102 and DEF-STAN 59-41, DRE03 with marginal
- The vehicle tested at SAAB EMC Test Centre "Best in Class"



Civil market wants E-Drive ”now”

Same environment as MIL but with even higher requirement → we learn → refinement E-Drive → ready for use for any market

A prototype now ordered from Atlas Copco



Summary

- Transformation into a new defence
  - Substantially strengthened defence capability
  - A functional, available and flexible defence
  - A new alignment policy – Swedish declaration of solidarity
- New accentuated principles for materiel supply
  - Extended use of existing materiel and market opportunities
- Challenges and trends
  - The complexity of operation – ”do more with less”
  - Finding the right balance between costs and performance
  - Survivability versus mobility
  - Situational awareness and Communication
  - Interface between platform and state of the art operators/soldiers


Questions...?